European Journal of Information Systems (2017) 26, 248–259

www.palgrave.com/journals

Open

RESEARCH ESSAY

The limits to language in doing systems design

Richard J. Boland Jr.[1] and Kalle Lyytinen[1]

[1] *Weatherhead School of Management, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106-7235, USA*

Correspondence: Richard J. Boland Jr., Weatherhead School of Management, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106-7235, USA.
Tel: +1-216-368-6022;
E-mail: Boland@case.edu

Abstract

We employ a conversational genre of performative research in order to explore foundational issues of language and design in information system practice. Initially, Sir Geoffrey Vickers (†2004), C. West Churchman (†1999), Hans-Georg Gadamer (†1982) and Jurgen Habermas are portrayed as engaging in a roundtable discussion on the topic: "Are there Limits to Language in Doing System Design?" We employ an updated, AI-enhanced version of Memex, an intelligent agent originally described by Vannevar Bush at the end of WWII, to serve as a plausible digital platform for enabling a discussion among intelligent agents, both living and dead. The Memex system conducts a spirited conversation among the four scholars and later brings Pierre Bourdieu († 2002) and Bruno Latour into the discussion in order to enrich the unfolding conversation. After the roundtable, Jurgen Habermas and Sir Geoffrey Vickers synthesize the learning from their perspectives.
European Journal of Information Systems (2017) **26**(3), 248–259.
doi:10.1057/s41303-017-0043-4; published online 22 March 2017

Keywords: practice-led; performative research; Memex; ideal conversation; social constructionist; *techne*; *polis*

The online version of this article is available Open Access

Prologue

We are intrigued by an emerging approach to research in social science that is rooted in a social constructionist sensibility (Gergen & Gergen, 2011) and is often referred to as "practice-led research" (Smith & Dean, 2009; Haseman & Maif, 2009; Rust *et al* 2007). The phrase practice-led emphasizes that the action of making and doing things by practicing artists, designers, inventors, architects and others who shape our sociomaterial world, should not just be seen as a subject for study using our traditional research methods, but should also be appreciated as unique research methods in their own right. The practice-led research movement holds that the artifacts which we create through our constructive practices while conducting practice-led research; from designing novel digital systems to creating unique strategies; from developing cities to inventing new types of built environment, can be understood as research reports (Barrett & Bolt, 2007; Haseman, 2007; Haseman & Maif, 2009). They are different from, but equivalent to our traditional ways of communicating research through expository texts in journal articles or through PowerPoint presentations at conferences.

The initial label of practice-led research seems to be appearing less often and is being replaced by the label "performative research," which we will adopt here (Callon, 2007; Roberts, 2009; Jones, 2012; Oxman, 2008; Denzin, 2001; Conquergood, 1989). Performative research reflects the generative and expansive view of social science research opened up by

Special Issue Guest Editors:
Michel Avital, Lars Mathiassen and Ulrike Schultze.

Received: 19 October 2014
Last Revised: 20 January 2017
Accepted: 27 January 2017

Austin's book *How to do Things with Words* (1962) and his coining of the phase "performative utterance." Schultze & Orlikowski, (2010) present an interesting analysis of what they refer to as the performative perspective and the broad range of subject areas to which it is being applied, from geography to psychology and beyond. We find Haseman's (2006) "A Manifesto for Performative Research" to be an especially cogent and powerful exposition of the importance of performative research as a third category of research method, equal to those of our currently recognized categories of quantitative and qualitative research.

Ironically, it seems that the growing pressure to hold education, including universities and their faculties, accountable for their productivity is contributing to the strength of the performative research movement. The UK, for example, has established a Research Assessment Exercise (RAE) conducted every 5 years with elaborate, detailed evaluations of the quality of research being produced by every department in every university, nationwide. The difficulty of categorizing and assessing the quality of research outcomes using only the traditional categories of quantitative and qualitative methods, has led the UK RAE to officially redefine "research" more broadly than those two traditions generally recognize. In 1996, the Arts and Humanities Research Council adopted an expanded definition of research for the RAE, which now reads:

> Research for the purpose of the RAE is to be understood as original investigation undertaken in order to gain knowledge and understanding. It includes work of direct relevance to the needs of commerce and industry, as well as to the public and voluntary sectors; scholarship, the invention and generation of ideas, images, performances and artefacts including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction. It excludes routine testing and analysis of materials, components and processes, as distinct from the development of new analytical techniques. (Broadhead & Howard, 1998, p. 4)

Note that this way of defining research as an original creation of knowledge and understanding is unapologetically broad and inclusive. It reflects a pragmatist position that true knowledge is useful in action to achieve human goals and what constitutes a contribution to knowledge, is based on that usefulness, not its conformance to the web of preexisting theories and to elements of currently accepted ones. It says that if the outcome of our inquiries makes a difference in what we can achieve by new ways of acting, valuing or understanding the world, it is a valid research contribution.

The conversational genre of performative research that we present here is enabled by a hypothetical, modern-day form of Vannevar Bush's Memex machine (Bush, 1945) – a kind of deep learning machine that has the ability to create intelligent agents based on the concepts, positions and patterns of argument in the writings of particular scholars, politicians, world leaders, writers, artists, public intellectuals and other significant thinkers, whether living or dead. The Memex in its appearance is similar to a 3-D video conference in which the synthesized voices of the participants are accompanied by animations of them.

In addition to an impressive breadth of knowledge based on the latest scientific, artistic and literary accomplishments of humankind, such intelligent agents are skilled in rhetoric and argument and can provide a conversational experience to support a decision maker's sensemaking, deliberations and choices. In this paper, the agents engage in a conversation among themselves like trading algorithms now compete in high-frequency trading. They could also be conversing with live actors who use Memex as an assistant, but for this experiment, the conversation is only among agents generated by Memex.

The Memex conversation was chosen as our research genre in order to bring the ideas of these authors to life individually and in interaction in a way that cannot be achieved in a "traditional" research paper. Whereas a traditional research paper follows a logic of being coherent and consistent in developing and presenting its argument and thereby strives to produce the single persuasive voice of an author, the research genre we employ here allows the diverse logics of multiple perspectives to emerge in a vibrating dialectic of claims, counterclaims, tensions and omissions thereby creating a complex, dynamic landscape of interacting perspectives. As such, the paper becomes more like a novel and the argument becomes its plot, emerging and being built as the reader seeks to infer what is going on behind what is being said in the text.

The things these characters say are not quotations from their writings, so there are no references to where these statements are to be found. But, we believe that the statements that Memex has given voice to reflect their key ideas and personalities. Hence, the conversational genre we employ represents a modest attempt by two scholars, who have spent considerable time thinking about each of these individuals' writings, to let them engage in a rather open-ended, Memex-enabled conversation and to see what happens. In lieu of quotations, we provide references to major sources that were consulted and used to test our ideas while developing this conversation.

The conversational performance by Memex begins with four agents created from the writings of four key scholars: C. West Churchman (1968a, b, 1971), Hans-Georg Gadamer (1976, 2004), Jurgen Habermas (1971, 1979, 1984) and Sir Geoffrey Vickers (1965, 1970a, b). Later, Memex adds Bruno Latour (1970, 1993, 1996) and Pierre Bourdieu (Bourdieu, 1977; Bourdieu & Wacquant, 1992). They explore the question: Are there limits to language in doing system design? This is an important question because the work of system design is about creating alternative futures possibly with different values, by shaping the physical, intellectual and social space in which human lives will be lived. By systems design, we are referring to systems of information,

of technologies and of organizing, as they exist in the world at the time of our writing. The motivation for this virtual conversation is to revisit the age-old question of why so many information systems disappoint us. Why do so many opportunities for human betterment through application of information technologies go unrealized? Why are so many digital systems not used to their full potential? And finally, is this the best we can do?

The Conversation

Geoffrey Vickers: I invited you to join this roundtable because you are some of my favorite thinkers on issues relevant to the design of information, organizations, technologies and other systems that constitute our world, including their socio-technical dimensions. I have a passion for seeking to better understand the way those systems function and interrelate in our increasingly complex world. And I invited each of you for my own reasons.

Professor Churchman, I invited you because I admire your work on developing a systems approach for critically analyzing complex systems with a unique philosophical position to guide a process of inquiry about them.

Professor Gadamer, I invited you because of your significant thinking about systems and life as a living tradition of meanings, which we can neither escape, nor control. Your writings on philosophical hermeneutics and the opening of our horizons toward each other continue to inspire me every time I think about it.

I invited you, Professor Habermas, because of your thorough and systematic attempts to develop a theory of action and social organization based on a linguistic turn. Your commitment to the importance of rational dialogue in searching for and bringing into being a just and humane world is an equally important reason for inviting you. I believe your ideas are especially important in the current social, economic and political conditions that we face around the globe right now.

So you might say that I have chosen this group as a reflection of how I would define myself. I am a retired executive who served as head of the UK National Coal Board, which shaped me as a pragmatist and system thinker, focused on our immersion in language and tradition. I recognize the socially imbued quality of the multi-valued judgments we must make in designing and managing technologies, organizations and information. The topic I have proposed for our discussion today reflects my own position that the language and cognitive schemas that we as humans have evolved over the last hundred thousand years or so, are now encountering a new kind of environment – one of our own making, in which we are increasingly blinded to the limits of thought and action that we have created for ourselves.

I would like to start our discussion by exploring those ideas a bit more fully and then open the conversation up to your criticism and your own positions on language, limits, systems and design. But first, I want to thank you all for joining me in tonight's roundtable discussion.

C. West Churchman: I am looking forward to it, but wonder why you haven't included some topics that are central to your question. You haven't, for instance, mentioned ethics as an essential feature of any such discussion.

Hans-Georg Gadamer: Well, I am a humanist and my interest has always been in fighting against the barbarian tendencies in our society that devalue tradition, human values and the spirit of a culture. I see most technologies and systems as undermining the great Western tradition of humanity. So it is important that we incorporate the value of a living tradition in our conversation, if I am to be satisfied with it.

Jurgen Habermas: The issues you raise are among the great challenges of modernity. I see in your opening statement a central problem that I also am very concerned about: namely, how systems colonize our lived experience. This is related to a deeper question that I have also sought to address throughout my life: Is there a possibility for a rationality that is based on going beyond a mere calculus of control and utility? Can we develop a speech community that displays and values that rationality in solving the chronic problems of our modern world?

Geoffrey Vickers: Excellent! Thank you all for that supportive attitude. Let me open the discussion by summarizing why I posed our topic as the "Limits to Language." I did so primarily because of a belief that all systems have an inherent set of self-generated limits and that those limits are associated with the characteristic dynamics of that system. This, of course, is a general system belief, and later I will identify some ways in which I see system principles applying to language. But another reason that I chose that title is Wittgenstein's haunting phrase from the end of the Tractatus, "The limits of my language are the limits of my world."

That line is so evocative for me that I find it popping into my thoughts all the time. So, both in the sense that all complex systems, including the centrally important one of language, self-generate limits (or have inner contradictions) which we must grapple with everyday, and also in the sense that we are contained in and bound up by a linguistically generated reality, which creates almost insurmountable difficulties for maintaining a peaceful world, I felt that "Limits to Language" would be an intriguing topic for us.

The limits to language that concern me most are: First, the limits related to the collapse of our multi-valued experience of human judgment into a single-valued language of policy discourse and, second, the limits resulting from a language that has evolved over many millennia of rather slow change, confronting a world of exceedingly rapid change. Let me discuss each of them briefly. I believe we are limited in our ability to reason at the policy level because we collapse judgments of what we value and what constitutes a betterment for us given those values, with judgments of what constitutes an expansion of our resources or an increased efficiency in our use of them.

Judgments of betterment are political judgments (*polis*), and judgments of expansion are economic judgments (*techne*), each having its own language and logic. Yet, we collapse the judgment of betterment into the judgment of expansion by relying on an economic language as the sole language for thinking through system questions of organization and design. We don't use a language of politics to discuss values in our judgments of betterment, and our organizations are worse off for it – especially in their uses of technology.

C. West Churchman: Are you saying that you disagree with the "Weltanschauung" or "worldview" of science and management scientists, which I have discussed at length?

Geoffrey Vickers: I'm saying more than that – I am saying that our language is inadequate to our task as responsible actors in today's world. It isn't just a question of our worldview. Our language, having collapsed judgments of betterment into an economic vocabulary of expansion, fools us into using a trajectory-like image for guiding our thinking about design, management and organization, regardless of our worldview. We are dominated by images of directionality, especially upward thrust, rather than images of evolutionary adaptation. In essence, the guiding imagery of our language is based on growth and forward motion rather than balance and adjustment.

As a result of that peculiar linguistic dominance, our language and its related mental schemata hide from us the systemic properties of self-generated limits in social systems and of the need for creating more cybernetic-aware vocabularies for use in policy discourse. We go around changing the world to suit ourselves and mistakenly believe that we are expanding our opportunities rather than limiting them. We believe our increasing use of technology is giving us increased power and control. We don't see that it is really creating new forms of instability in our social systems and that those instabilities become the source of new problems, which we then address with the same misguided logics of expansion and control.

Hans-Georg Gadamer: I agree with you that our current thinking is limited in its view of language and has only a minimal understanding of the limits to language. Hence, the discourse on managerial decision making ignores the idea of polis and sees it as *techne* only. Yet, everything we experience and make sense of in our world is mediated by our language.

As I have said: Language is the house of my being – there is nothing outside the lived experience of language – it is fundamental to all human existence. Therefore, cutting the language of management off from the full living tradition of human experience and human judgment means reducing our potential for a full human life. We are also blinded and incapable of expanding and renewing our living tradition. In fact, we cannot even generate new and important questions by which we could approach our experience and history. Instead, we can only ask a limited set of questions in the face of so many new technologies and systems that emasculate our experience and life. Simply put, our tradition is decaying and we are moving to a barbarian state dominated by *techne*.

Jurgen Habermas: I must say that I am not as pessimistic as my esteemed countryman about the future potential of our world and its capacity for managerial response. Although I see that the language of cybernetics may be too limited to address the issue we are talking about here – in which I totally side with Professor Gadamer – I am more optimistic about how, even though language pervades all realms of human action, it can and must overcome its technocratic straitjacket. As I see it, we do indeed need modes of language use that can approach the world with the idea of control and efficiency and a calculus of utilities applied to outcomes of action. This is necessary for freeing us from the limits and whims of nature. But this is not enough for a full human project.

We must also create modes of language that enable us to live our life meaningfully with our fellowmen. Only then can we understand the conditions of being a human being – the question Aristotle clearly posed when he separated *techne* from *polis*. It is only in this context that the idea of right and wrong and our mode of justifying action come into focus. The great tragedy of modernity is that our life-world has become colonized by the system logic of money and control, in which human values are becoming lost. Our language blinds us to see only what it lets us see, yet we believe that it enables us to see everything.

To overcome this danger we must admit the universal nature of language as a medium and means for rationality, which includes submitting to the force of the better argument and seeking to be freed from vested interests and domination. Our language has limits, but these limits are not closed forever and for everyone; rather they are partially determined by the social conditions that non-reflectively produce them, but we can overcome those limits through reflective effort. We don't see everything, but with careful reflection, we can see more and see it more clearly.

Memex: I am taking an executive action by bringing Pierre Bourdieu into the conversation. He has been texting me since you began, asking to be allowed in. I anticipate it will be a better discussion if he participates.

Pierre Bourdieu: Thank you for letting me join, it is a great privilege for me to interact with all of you. I would like to state right at the beginning that I take the limits to language to be quite different than what has so far been proposed, especially if we mean to reflect on the practice of organizational work. I think we need to step down from the abstract world of your ideal constructs and explore what people actually do in organizations with their language and technologies and how these accomplishments create necessary and non-necessary boundaries for our talk about those practices. If organizational work means the construction of practices in organizations, then I think it is much more appropriate for us to step back from suppositions about language structures

and look carefully at the field in which that language operates, especially the struggle for power in that field and the ways in which organizational work is a structuring structure.

By that I mean that we must attend to the ways in which system work is the reproduction of power relations and the redistribution of capital in organizational fields, and how language is the most important medium in this struggle. Language has a structure, which shapes the ongoing creation of other structures. In this way, systems of social organization and technologies become structuring structures, and in so doing, they objectify the subjectivity which Vickers prizes so much.

If there is a limit to language, it is found in the ways in which individuals come to believe that their habitus – their orientations, expectancies and readiness to act – are a universal subjectivity rather than a localized field of practice in which their particular subjectivity is generated, through a dynamic interplay of binary oppositions that mark significant positions in their field and provide a basis for the forms and distribution of its capital. In other words, it isn't the logic of the actor, the tradition or the universal pragmatics of language, but the logic of their practice in its field that is going to generate the propensities of that field that we must consider if we are to explore the limits to language in doing systems design.

C. West Churchman: I feel that you are at once too close to the ground with your talk of local practices and fields and too far from the real problem with your talk of structured structuring structures. Yes, we have habitus and fields, or as I prefer to say, "Weltanschauungs," but that is a condition for the operation of reason, and it is the operation of reason that we must pay attention to here. In this sense I side with Habermas that we must redeem and defend reason as the ultimate ground of any limits to language. If there are limits to language, they will make a difference in what matters most – our choices – or they will make no difference at all. And the central requirement for making good choices is for our reasoning to have a guarantor.

The guarantor of reason in language use will ultimately be concerned with finding a way to, as it were, swallow the whole of systems, including technologies, information and organization – all of both *polis* and *techne*. By this I mean that reasoned choices, to be rational in any meaningful sense, must be choices which consider the whole relevant system and choose from the full set of available alternatives. That guarantor must also offer us a compelling logic as to why and how we design and choose those specific alternatives.

So it is not the thing that someone does or wants to do that determines its rationality, but all the things that they do not do or not choose to do. It is the continued construction of the missing alternatives that we could choose from among, that we should be paying attention to, if we are serious about the real limits of language. In this regard the idea of conditions in which language is used freely – the ideal speech situation – is an excellent contribution to our thinking about our limits to language and the implications for systems design. But another consideration is the recursive and complementary nature of different inquiring systems that we mobilize in those debates.

Looking at practices may be of some relevance in the modeling of systems, but it is on the modeling of our world and of worlds other than ours, through the use of alternative inquiring systems, that we must focus, not on practice as it is today. Modeling of possible worlds and inquiry into their functioning as wholes, where debates emerge and are conducted with good will, is what will enable us to create a more enduring and beautiful world. In the end, this is what doing systems and organizational design is all about.

Pierre Bourdieu: All the other possible worlds??… and their alternatives?!.. Worlds other than our own?… Such bizarre and uniquely American ideas of "boundless frontiers" and manifest destiny. The logic of practice is always very heavily constrained when our habitus, as subjective memory, meets the objectivity of a field. Our history is brought forward into the present in our habitus, or through living tradition as the esteemed Professor Gadamer would say. We face the field we are located in as an objectified structure – a tradition – that we cannot reinvent. The result of this encounter with a field is an objective set of probabilities for alternative paths that a practice can take, not an open world of "anything goes" or one where we unilaterally can decide what is best for us or for others. Here the structuring structure can act as a springboard for the types of questions that we will ask in these encounters and thus condition how systems and relations are organized differently.

Memex: Sorry to disturb your conversation again, but I promise this will be the last interruption. Among the many distinguished agents following this most interesting roundtable is Bruno Latour. I have rejected all other requests to participate in it, but feel compelled to allow him to join for the sake of a more comprehensive set of voices in the roundtable discussion.

Bruno Latour: Thank you for those kind words. If I may sneak in a word edgewise here, I am fascinated and also humbled by the incredibly detailed knowledge and precise expression you all possess about something I find utterly mysterious. The words you have been using with such abandon – words like society, structures, policy, ideals, tradition, polis and so on are completely beyond my humble ability to use as deftly as you do. My vocabulary in comparison is quite poor. I don't know how to begin dealing with these invisible things you seem to take for granted – where can I go and observe them? What door should I open so that I can learn to know them in this amazing way?

I know it's tempting to speak of such imaginary things as if they had a certain causal power in our life. These kinds of fetishes can perhaps bring some piece of mind or

at least provide a handy pivot point for your arguments, but they should be resisted if we are to say something interesting about technology, language and organizing.

When I told my friend Barbara Czarniawska that you were going to have a roundtable on the limits to language, she immediately shouted: "There are no limits to language! We are always saying new things, always inventing new words, creating new forms of expression and new genres!" And, of course, she is right, but I do see even in your discussion so far this evening how particular ways in which the participants use language sets limits for our thinking. Sir Vickers, for instance, argues that our language tricks us into thinking about trajectories when we really should be thinking about evolutionary adaptability. But either way, whether it is a mythical journey to greater heights, or whether it is sexual reproduction making us ever more fit as a species, you end up fixated on an imaginary essence without realizing how that essence is necessarily tangled up in all manner of mysterious, invisible causal explanations.

Professor Bourdieu for his part is limited by the very precision of his language: So that fields, habitus, forms of capital, positions and power struggles become a landscape from which he cannot escape to simply look around and consider what other things might be going on in creating language, organization and technologies. What a dreary, predetermined world this language of practice becomes, in which we explain everything, yet we understand nothing, and in which we purify our predetermined analysis with reflexivity on our own reflexivity. These reverberating reflexive shadows do not help our eyesight. Instead, it is a humble, open set of eyes and ears we need in studying language in doing system work.

Churchman wants us to be able to see wholes – but the social world we live in is flat and indivisible. There is no place one can stand to see wholes or anything like them in this flat world of ours. There are no lumpy, abstract high points in the landscape: A closely limited horizon of local situations is all we can see and navigate within. So immediately his language limits us to the unseen, the unspeakable and the unreachable. This, I hope you will all agree, is a pretty severe limit.

With regard to Professors Habermas and Gadamer I have very little to say as my humble mind has never reached those heights of German philosophy. What can I, a sociologist from a French mining university, say to two of the grandest philosophers of our past century? Whose intellectual edifice is so high and has so many rooms that I do not know where to start opening the doors? I see no living traditions and I see no forces of better argument. I see only tricks, persuasions, connections and artifacts that are mobilized in these vibrating networks of actors and actants. The story here is that there is no grand story – we are no longer modern.

Pierre Bourdieu: Professor Latour is a bit too flamboyant for my taste and his false modesty of how little we know about organizations and systems is not well founded. I do know something about information, technology, design and organizations. I know, and I believe anyone who takes the trouble to collect and quantify and categorize the relevant data in as exhaustive and careful a manner as I have, will also know certain things about the fields, habitus and practice involved. The field of the technology analyst is a globalized professional field in which consultant/designers struggle for the cultural capital of intellectual achievement and for economic capital. The field of the worker is principally a local organizational field in which workers struggle primarily for the social capital of affiliation and the financial capital of rewards.

From this view, the problem of implementation is readily apparent. The logic of practice of the consultant/designer expects that workers should be readily willing to make some simple change in daily routines because it is a rational response to the functional requirements of accumulating intellectual capital. For the worker, embedded in a generative cycle of social and financial capital-based practices, a change that is considered minor by the designer is in fact a threatening disruption of their life and their very position in the field. It is a robbing of the very relations and conditions on which their capital is based.

I further know that the consultant/designer and the worker are in fields with different temporal rhythms. For the worker it is a rhythm of short cycles and many repetitions per day. For the designer it is a long-cycle rhythm with weeks or months between milestones and repetitions. For the worker it is a rhythm of familiarity – for the designer a rhythm of novelty. The designer moves freely through a global professional space, while the worker is generally confined to a local market of limited movement. And I could go on and on with these things we know quite clearly about information, technology, systems and organizations. It is not so mysterious as you claim and there is a very clear sense of what design is all about in this field.

C. West Churchman: I agree with you on that last point, at least. But in my own defense, I know that the designer does have to act. As befuddling as the situation might seem, designers have to muster the courage and the moral judgment to model the whole as best they can, recognizing the inferential leaps involved, and the difficultly of making a choice. Imperfect as this sounds, and difficult as the limits to language we have all identified make it, in the end, the designer has to act and he has to act responsibly. Because of that, I know that reason as a guarantor for the designer's action is the foundational problem of language that we must address.

There is a peculiar sense in which all of you are using vocabularies that are implicitly claiming to let us hear or see organizations as they really are. Of course, you know I reject that claim, but what are we left with? What kind of conversation do we make with all these vocabularies overturning and undermining each other? I think of Wittgenstein's comment on language as a tool box from the Philosophical Investigations: "And how many kinds of sentences are there? Countless kinds. Think of the tools in a tool box."

I would like us to think of the different vocabularies we have displayed here tonight not as contestants in a competition to see who is right or who is closest to getting the correct description of technology or organization or system design, but as tools available to a discerning crew of workers doing system work. Or perhaps we should think of them as voices in a chorus where the thing we try to get right, as it were, is the harmonious blending of voices – the aesthetics of representation that we can interweave with these diverse voices – like Bach's great oratories. We must also explore whether the voices in this chorus can open us to invite in other vocabularies of representation including sound, visual imagery, art and even dance.

I like Barbara Czarniawska's intuition about the question of limits to language. There are limits to language only if we let there be limits. As Professor Habermas points out: We should not shut off other voices and close off our conversations because we fear they might lead to dead ends or go against our vested interests. But, of course, this may leave us in a self-made dead end, because we began conversing only with those who prefer our own favorite vocabulary or rules of engagement. Keeping the conversation going with an open and changing chorus of vocabularies is the best way I know of to keep language free of limits.

Geoffrey Vickers: This notion of music, imagery and art is one point I strongly agree with. I've always felt that there are multiple forms of consciousness at work in the way judgments are actually made in organizations. I've always thought that multiple kinds of sensations were constitutive of what I call appreciative judgments, which is when our judgments of reality and our judgments of value are brought together in a multi-valued judgment of fit. We know something is the correct thing to do not because of logic alone, but because of an appreciative judgment of fit between multiple values and reality. Appreciative judgment of fit rests on aesthetics and on the use of all of our senses in determining appropriateness and desirability. Appreciative judgment is what drives action, not rational choice.

Bruno Latour: But you know, Sir Vickers, as I sit here listening to you, it suddenly hits me how you yourself are trapped in a limited vocabulary of associating thinking and reasoning as something that happens in our heads and something that takes place in words. I much prefer to think of thinking as something we do with our hands and our bodies. As Hutchins shows so beautifully, our cognition is a distributed cognition in which humans and artifacts together create calculation and intelligent performance – a thing which most Western philosophy has ignored since Descartes.

It is as if humans have no body, only brains and they can mostly only see or hear text. So rather than being trapped into a confusing vocabulary based on a thinking mind without a body, as you seem to be when you ask us to keep our thinking open by keeping our vocabularies open, I would much rather have us consider thinking and mind as something we make together, using our bodies in relation to artifacts, handwork, physical motion, tactile manipulation, inscriptions and, of course, words as well. The focus would then be on the making of cognition and action in as open a way as possible, not just blending minds' diverse voices as if they were ready manufactured in our brains.

To pick up on the tool metaphor you started to develop but then dropped, I would like us to think of system work as a tool-based collective work. The tools we use in this work are multiple professional languages, and the kinds of tools we are able to put our hands on are the vocabularies and other artifacts that are mobilized through the deployment of those vocabularies. It is not just the words we use but all the things we do with them, with our bodies and our hands that do the thinking, and in that sense, the language of system work is the network of actors and actants that are mobilized through these multiple vocabularies.

Maybe if we could see a kind of motion picture of the system worker, close-up, it would help us see how unique and singular each site of system work is and how it sets in motion multiple different actors and their scripts. If there are limits to this handwork language, they are to be found in each filming location where the actors are making their own contexts and their own scripts as they make the organization and its information systems. So there are only local limits, and local limits will prevail in language use.

Pierre Bourdieu: Yes, there is a sense in which there are only local limits, but this is true in a trivial sense, only – a sense in which the langue and parole of language are confused. The local, situated use (*parole)* of language (*langue*) will always be a limit in a superficial sense. But in a generative sense, in the only truly important sense, the structuring structure of language, its *langue*, is the determining language operation. Only *langue* and the structure of its binary oppositions set the limits to language that will prevail.

C. West Churchman: I feel that in my saying what I conclude about language, I have ended up being mischaracterized here, and perhaps at some later time that is a part of the limits to language that I will think about further. But for now, what I must point out is how my discussions about reason, guarantors and the need for a sense of the whole system, have turned out to mask something even more important in my views on language and their limits – something that serves as my ontological grounding and is in stark contrast to Professors Bourdieu and Latour.

Reason, guarantors or a sense of whole are not the wellspring of my thinking – they are merely the best conclusion I can reach, using both logic and emotion. The wellspring for my thinking is the individual human being: the lonely, isolated, mortal, struggling, flesh and blood human being who makes choices and acts – that is what requires reason, a sense of whole and a guarantor. And that foundation of the singular, passionate, morally

responsible and often anguished human being from which I draw my conclusions is missing from both your arguments. I am a humanist, pure and simple, and I am proud of it. I reject what both Latour and Bourdieu have said – realizing that they disagree between themselves quite strongly, but seeing each of them in their own way as having lost sight of the primacy of the individual.

Latour accuses me of looking to the imaginary and the unknowable for the operation of reason. But he, in turn, has made the individual disappear in favor of a circulating network of humans and artifacts, any node of which is subject to mediation and translations of interests. Bourdieu makes the individual disappear into recursively reproduced practices, where habits replace the passion and will of the singularly potent person. Give me the flesh and blood, the agonizing existential reality, of a human being facing the dread of everyday responsibilities. That's where I want to start. That is what is real: the individual human actor answering to God and the future of humankind for her actions.

Hans-Georg Gadamer: I must side with Professor Churchman here, but with a twist and a reformulation. As I said in the start of this conversation, I too am a humanist – I have always been a humanist and I am proud of it! Therefore, all this technospeak is quite alien to me, and I felt uncomfortable to participate in a project like this, but I decided to do so because I want to defend humanism as our only hope for a meaningful life.

What I see coming from today's technologies, information and systems is just the opposite: It has made our culture banal, and it has commercialized all experience and narrowed down our sense of history by weakening the effect of tradition. Therefore, assuming that individuals make choices is the first hope for strengthening humanism. But I must go against the idea that individuals in the end make decisions freely. It is the effective history of tradition which binds these humans and which enables the individuals to move to a new understanding, which, in turn, opens us to new meanings. Individuals outside of and without tradition remain powerless; they do not participate and live the making of history.

Memex: Sorry to disturb your conversation again. It looks that our time allocated to this debate is running out. We are reaching our computing quota in the cloud. Therefore, I must reject all requests by other participants to continue their statements. Instead I have asked Professor Habermas to provide us a closing statement, because he is well known as a great synthesizer of philosophical and social theories of the twentieth century. So please professor Habermas, the floor is yours.

Jurgen Habermas: Thank you for this great honor and challenge. As I said a few minutes ago, I see myself as a humanist who tries to understand the social, political and technological challenges in our age of late capitalism. Due to the complexity of this form of society, articulating a humanistic stance will take some time. So forgive me for this longer statement putting together so many different strands of thought which have been expressed here. It will not be easy to find a way out of this maze. First, and most importantly, for me personally, humanism is not the simple idea of making choices and being free. It is instead, the hope that we can avoid another round of holocaust – the horrors of which shaped my youth. We are always faced with the agonizing responsibility of not repeating that history. Nothing could be more daunting or more critical. Therefore, when I say I am a humanist, I mean that my understanding of the world centers on the idea of an individual and his or her moral responsibility toward other human beings and also toward nature. Everything flows from that core commitment.

Yet, no matter how beautiful and brave that idea is, as a belief it is powerless unless we amplify it with an appreciation for the necessity of critical discourse and an abiding belief that things can be made better on rational grounds. The future is always open to us; unlike the laws of nature, the laws of society can be altered through rational discourse leading to decisions about how we will make and remake our future. In other words, the humanism I refer to combines taking design action and taking a rational stance. This enables us to see that designers agonize about how things can be otherwise on a rational basis – one of the major arguments that my mentor Adorno constantly repeated. Asking the question of how things could be otherwise, invites us to explore how power and domination shape our thought and action, how some voices are not heard and not allowed to be heard, and the ways in which our communications are distorted.

There is another aspect to design and systems of any sort, which relates to the question of what is the "world" that we are designing and projecting ourselves into? Only the most naïve engineers think that design is just the reconfiguration of the external world and is about gaining better control over it. There is no sense of beauty or justice or truthful world in such an idea. Today, the language of design that we employ is very limited and crude – it does not matter whether we are engineering atoms, bits, molecules, emotions or social bonds. It's all the same and unfortunately it seems that more and more we think and act as if they are all the same. This attitude can be useful when thinking about effectively organizing social life and processes. But, when it is allowed to run amok – as it increasingly seems to be – it will create a system world colonized by blind power and money.

I see Bourdieu's idea of fields and power relations to be a good representation of how our world of design will be cynically seen, if we assume that only self-interest (or no interest) and the engineering of social bonds prevail. For some, societies and their design resemble programming genetically or conditioning human ant communities, and we could become behavioral animals that can be programmed with specific responses. I can see value in such analysis for understanding the lower bound of organizing. It is also very revealing as a theoretical lens to view how social action (in its socio-technical and

sociomaterial aspects) is theoretically analyzed in post-modern societies. In the end, all that is human and regarded as the social, is emasculated, trapped in an iron cage, like a jungle of human ants.

I believe that Sir Vickers' call for real politics and value judgments with recognized (ethical) norms and values that are morally binding is necessary in our critical design of social systems. These norms are not easily identified, controlled and manipulated, but they are the foundation of social bonds, i.e., the social contract which defines us as free men and women. With the idea of contracts we can move beyond an image of humans as ants in a jungle and treat humans as members of *polis*.

This shift requires our designs to coordinate action between the world of social norms and the world of things and objects. This is valuable and good as it raises our understanding of how we limit our designs with the specific languages we employ (or live through). But Sir Vickers' analysis still leaves open the question of how we come to see these norms as morally binding. I believe in the value of Gadamer's notion of tradition and of the horizon of meanings it implies. Tradition and the fusing of horizons are what enable us to push back on the limits to language as we "design" or rather "build" our life-worlds. Norms make sense to us only when they are mobilized in action, including acts of communication. The possibility of an ideal conversation provides a basis for all our norms and becomes standard expectations of moral and rational human interactions (e.g., to use language correctly, to be clear, to be truthful, to be cooperative and to assume that we and others are genuinely seeking truth). Those standards of an ideal conversation are the conditions of possibility for a just and humane society. And they are what is being undermined by the leaders of the so-called advanced world today.

The idea of a living tradition assumes that our norms will evolve and depend on our varying life-worlds. We are not ants. We are designing, free moral beings who have the capability to communicate and express our concerns in ways that create normatively and ethically binding contracts with rational justifications. I suspect that the norms of ideal conversation are the only thing keeping our designs and a design language moving forward.

Geoffrey Vickers: Well, those are some very pointed remarks that none of us will easily forget. I can see why so many are fearful of the era our world is entering. On the other hand, forewarned is forearmed, and we have surfaced and discussed some images of the present and some ideas about the likely future that can be helpful to those responsible for policy across all types of institutions. I suggest that we share these ideas with others – not just scholars, but activists, politicians, community leaders, those in the media, and even the popular press. Our group seems to have covered a lot of ground here in our roundtable discussion, and Professor Habermas has concisely captured some of its central underlying themes. Due to the complexity of the ideas we have explored, I am hesitant to try summarizing it in a concise way. But that is the role I have agreed to perform, and in Churchman's powerful expression, I agonize about it but will attempt to do it anyway.

One theme that runs from the beginning to the end of our discussion is that of ethics, and the way it is central to our ability to engage in ideal conversations, which are the bedrock of our ability to create a vibrant, reliable human community. A second theme is the contrasting sources and implications of the humanist versus technocratist position. What the humanist sees as a colonizing of the life-world, the technocratist sees as a salvation from pain, deprivation and bondage. It seems that this important distinction in what Churchman has referred to as our worldviews, is related to my own distinction between two forms of policy setting – on the one hand, a robust multi-valued choice that is understood as a process of balancing competing forces, much like a dialectical oscillation, and on the other hand, a linear, unidirectional process of expansion and growth. I have made my position clear on this dichotomy, but the question remains, how can the current situation, with its unfounded belief in the desirability of a linear, upward trajectory of continuous growth, be displaced by the more realistic belief in an evolutionary dynamic of continuously balancing and rebalancing our desired trajectory, as a preferred basis for setting public policy?

A third issue appears to be the role of interpersonal language use and the image of an ideal conversation as a way of expressing and resolving moral questions and providing the basis for our development of accepted norms. Here we encounter the possibility of grounding ethics either through a kind of structured, rational process of resolution with specified forms of discourse to identify and agree upon a more fixed code of ethics, as some of you prefer, or through a more casual conversation as a way of less methodically laying down a more flexible ethics that can be shaped and reshaped in action to fit the particular circumstances of changing situations and system designs. We also appear to agree that language forms the means by which the elements of a design become related and by which the various types of future worlds are imagined and constructed. At the same time, we had several different opinions about how these worlds come to be and on what grounds we can distinguish between them and if we can escape the inner contradictions that so many systems embody.

Some troubling, unresolved elements of our conversation will engage my thinking for a long time after this roundtable ends. First, the notion that language is tricking us into seeing the world in a particularly biased way, even apart from any political or moral position we might hold. Is there a way to overcome biases, or to know which biases are positive and generative to a design and which ones are not? How do we come to see the biases in language if we are at the same time prisoners of that language?

Second, are we able to construct and evaluate well-founded arguments and create morally binding agreements for design? Such agreements are required for a rationality that goes beyond mere calculations of costs and benefits as we engage in design.

Third, we all live in local worlds with unique situated logics and specific language games. Does the inclusiveness and sense of whole desired by Churchman and advocated by Habermas mean that our species' success is dependent on our being able to hold in dialectic tension both poles of the global versus local logics that our conversation today seems to imply? If so, how is that possible for a sentient being striving to be rational in the view of society?

There are other important issues that surfaced in our roundtable today, but these three are the ones that I will carry forward for personal consideration. Perhaps you have other issues that you see as most critical, if so, I look forward to hearing from you in the Memex blog sphere.

Epilogue

The initial writing of this piece dates back about 20 years. The beginnings of a first draft were written during a very pleasant week visiting at the University of Gothenburg while attending a week-long series of workshops and seminars. It was another 3 years before a rough draft of most of the materials was developed. That version was presented at an IFIP 8.2. research workshop, where a few senior scholars in attendance acted as readers of the characters as if they were rehearsing a play, and it received some positive feedback. After that it was another 8 years or so before a full version with all the current characters was developed and was performed by some faculty from our university theater department along with the authors. Based on the feedback, the text was shortened and streamlined for clarity. Since then the main narrative has stayed in the same basic form, while the final expansion has focused on the prologue and epilogue, clarifying the nature of the genre and discussing its value.

The first versions of the manuscript were neither written nor anchored in the idea of conversational genre. The idea of this genre emerged gradually when we tried to jointly make sense of the value and inner logic of writing in this form. The original text focused on juxtaposing different thinker's ideas about uses of language and design into a serial flow of statements about each one's position and to demonstrate the relative positions of each with regard to those of others. This original idea is still present and is an important element of the narrative.

The value and beauty of this style is that it forced us to present the ideas as originating from the perspective and conviction of an "I" – with each person talking his ideas into being in a social setting rather than conveying ideas in a neutral and distanced form of third-person writing found in their main texts (although we recognize that Latour has used a similar device and has had technology take roles and speak in his book, *Aramis* (Latour, 1996). We discovered that along with the use of 'I" came the possibility for characters to express affection, emotion, humor and commitment toward their ideas.

Once the writing of the conversation started to build a kind of rhythm, it allowed for differences between the characters to emerge more naturally, and we found the characters reacting to the statements and positions of the others. In this way, the writing is not only about what is being said and how the flow of ideas originates and shifts, but also hints at how personal history, context and character influence what is being said. We naturally have not met or talked with all the characters included in the play, but many of the statements, style and idioms come from the presentations we have heard by the authors or from the conversations we have had with many of them. For others, we examined their biographies to better understand their personal traits and history.

Our desire to present the author's ideas in a conversational form with an emergent expression and development within the dynamics of their social interaction pushed our writing to seek an authenticity grounded in the statements made by each author to the others. In this way we attempted to be faithful to how each author's ideas are being constructed as they are being conveyed. This is primarily accomplished by the use of an interactive conversational style that grounds each statement by an individual within the developing context of what all the participants are saying or not saying. Throughout their conversation, each one is speaking in response to or in anticipation of what the others have said or might be about to say. As a result of using this dialogical form, the manuscript emerges within and through the process "talking back and forth" rather than presenting the authors position through a soliloquy.

By giving voice to one author at a time, we are revealing the research process via the research product. Recall from the prologue that this unique form of transparency is a distinctive feature of performative research. The research outcome is not presented in the default expository text or PowerPoint presentation, but instead is presented in the same symbolic system with which it was constructed.

By allowing each voice to have its own way through an iterative back-and-forth exchange, the research process is a rich, heterogeneous and dialectic one in which surprises can be expected and are not disruptive to the logic when they occur. In traditional social science research, the writing genres of expository texts present the research as a coherent, cumulative argument in which a uniform set of data is analyzed and a consistent, well-formulated conclusion is produced. The conversational mode of performative research, in contrast, appears incoherent to a traditional research audience with quick jumps from one perspective to another, highlighting multiple, different sets of data that can

often incite emotionally charged positions, in which surprising, counterintuitive claims can result. Instead of the coherent sequence of theoretical grounding, argument development and conclusion justification found in traditional forms of written qualitative and quantitative research, the conversational mode of performative research is one in which no one can know where the thread of thought is likely to lead and the anticipation of meaning can end in surprise.

The first-person style of the conversational form presents each author's ideas as innocent, emergent and fleeting. The ideas never get forged into a final complete form as found in written scientific articles. Authors' personal statements do not portray the same quality of intellectual authority as produced by the straight serial logic of statements in traditional third-person writing of scientific articles. The ideas come in tentative and incomplete snips for discovery, contrast, expansion or throwing-away. Ideas are being spoken by one participant and listened to by other participants as they concurrently react to what is said based on what they are interpretively hearing. This generates a dialogical form of narrative that is common in fiction, in plays and so on, but rare or nonexistent in traditional scientific genres. Traditional research genres, in contrast, have a mono-logical form: One person (he/she) or a group of persons (we) make a complete statement that has to be accepted as a whole or not at all. The conversational genre of performative research, in contrast, has continual shifts that reveal tensions between the presented ideas and invite new voices into its openings, reflected in the way that speakers intermittently comment, expand and contrast their ideas with those of others. Many of these moves are unexpected and can push the conversational logic away from the "tight" logic which was just presented by one of the authors.

The conversational form thus emulates and sheds light on the power of informal dialogue that fills the lives of all scholars and forms the informal, hidden background of all great scholarship. This is not the hermeneutics of wholes and parts, but the hermeneutics that emerges from juxtaposing different forms of "pre-understanding," a colliding of alternative "meaning horizons." The conversational form invites us to celebrate the value of ambiguity and apparent incompleteness of the narrative as for example summarized in three challenging questions posed by Sir Vicker's at the end. What we gain from this incomplete form is the generative power of fluidity and heterogeneity of ideas and the fun and struggle we will experience when the nascent, semi-confusing meaning we are about to discover needs to be dressed in a new presentation of shy, carefully formed tentative words. The conversational mode of performative research ultimately shows us that a life of ambiguity is what all scholarship must honor and value. It is from such surprising, seemingly incoherent moments where the rare, creative sparks of intellectual discovery spring forth. A performative turn in social science is one way to keep its excitement and productivity vital and important to humanity and to the project of designing better social worlds.

Postscript

Habermas speaks to the others in a low, serious voice after the meeting is over and coffee is being poured for the audience.

Gentlemen, I have something to say that I feel I must get off my chest. It is hard for me to talk so honestly about such important matters without becoming agitated about the implications. For the past year or two I have been frightened. When the norms of ideal conversation are ignored or actively broken by political leaders as we are seeing today in the highest offices of the leading nations, a downward spiral becomes more and more likely. As standards of truth are diminished, language is used to obfuscate, good intentions toward others are extinguished, genuine cooperation for mutual benefit with others is no longer expected, trust of others is neither granted nor received, people do not believe that others are genuinely seeking truth in their interactions, it becomes more and more difficult to tell truth from falsehood.

As a result, political, commercial or religious leaders do not display the qualities of an ideal conversation in the daily conduct of their duties. Quickly, they diminish themselves, their office and their institutions. In government, especially, they weaken the possibility for an effective *polis* and they erode their own ability to be a successful leader. As people lose their belief and trust in democratic political systems, they are handing their country over to demagogues and dictators. The thing I have dedicated my life to stop from ever happening again – a holocaust-like calamity – gets more and more likely by the day.

But I will not give into my fear, and I hope none of you will either. As Michel Foucault has so powerfully argued, we can and must resist. All is never lost. If we can strongly resist, the power of ideal conversation can dominate. But we must resist. I'm getting old, and tired, but perhaps you can help me spread awareness among the younger generation.

About the Authors

Richard J. Boland Jr. is Elizabeth M. and William C. Treuhaft Professor of Management and Director of the Ph.D. program in the Department of Design and Innovation at the Weatherhead School of Management, Case Western Reserve University, Cleveland Ohio.

Kalle Lyytinen is Iris S. Wolstein Professor of Design and Management and Chair of the Department of Design and Innovation, and also Director of Academic Affairs for Doctor of Management Programs at the Weatherhead School of Management, Case Western Reserve University, Cleveland Ohio.

References

Austin JL (1962) *How to do Things with Words*: *The William James Lectures Delivered at Harvard University in 1955* (Urmson JO and Sbisà M, Eds), Clarendon Press, Oxford.

Barrett E and Bolt B (Eds) (2007) *Practice as Research*: *Approaches to Creative Arts Inquiry*, I. B. Tauris & Co. Ltd. London.

Bourdieu P (1977) *Outline of a Theory of Practice*, Cambridge University Press, Cambridge.

Bourdieu P and Wacquant LJ (1992) *An Invitation to Reflexive Sociology*, University of Chicago Press, Chicago.

Broadhead L and Howard S (1998) "The art of punishing": the research assessment exercise and the ritualisation of power in higher education. *Education Policy Analysis Archives*, **6**(**8**), 4.

Bush V (1945) As we may think. *The Atlantic Magazine*, July 1.

Callon M (2007) What does it mean to say that economics is performative? In *Do Economists Make Markets? On the Performativity of Economics* (MacKenzie D, Muniesa F and Siu L, Eds), pp 311–357, Princeton University Press, Princeton.

Churchman CW (1968a) *The Systems Approach*, Delacorte Press, New York.

Churchman CW (1968b) *The Challenge to Reason*, McGraw-Hill, New York.

Churchman CW (1971) *The Design of Inquiring Systems*: *Basic Concepts of Systems and Organization*, Basic Books, New York.

Conquergood D (1989) Poetics, play, process and power: the performative turn in anthropology. *Text and Performance Quarterly* **1**, 82–95.

Denzin NK (2001) The reflexive interview and performative social science. *Qualitative Research* **1**(**1**), 23–46.

Gadamer H-G (1976) 2nd Ed. (Ed. and Trans. by Linge DE) University of California Press.

Gadamer H-G (2004) *Truth and Method*, 2nd Rev. Ed. (trans. Weinsheimer J and Marshall DG), Continuum, London.

Gergen MM and Gergen KJ (2011) Performative social science and psychology. Forum: Qualitative Social Science Research 12/1, Art. 11, Reprinted from Mey G and Mruck K, Eds, *Handbuch Qualitative Forschung in der Psychologie*, pp 358–366, Springer, Wiesbaden, 2010.

Habermas J (1971) *Knowledge and Human Interests*, Beacon Press, Boston.

Habermas J (1979) *Communication and the Evolution of Society*, Beacon Press, Boston.

Habermas J (1984) *The Theory of Communicative Action. Vol. I*: *Reason and the Rationalization of Society* (McCarthy T, trans.), Beacon Press, Boston.

Haseman B (2007) Rupture and recognition: identifying the performative research paradigm. In *Practice as Research*: *Approaches to Creative Arts Inquiry* (Barrett E and Bolt B, Eds), pp 147–158, I. B. Tauris & Co. Ltd., London.

Haseman B (2006) A manifesto for performative research. *Media International Australia Incorporating Culture and Policy* **118**, 98–106.

Haseman B and Maif D (2009) Acquiring know how: research training for practice-led researchers. In *Practice-Led Research, Research-Led Practice in the Creative Arts* (Smith H and Dean R, Eds), pp 211–228, Edinburgh University Press, Edinburgh.

Jones K (2012) Connecting research with communities through performative social science. *The Qualitative Report* **17**(**41**), 1–8. Retrieved from http://nsuworks.nova.edu/tqr/vol17/iss41/3.

Latour B (1970) *Science in action*, Harvard University Press, Cambridge.

Latour B (1993) *We have Never Been Modern*, Harvard University Press, Cambridge.

Latour B (1996) *Aramis or the Love of Technology*, Harvard University Press, Cambridge.

Oxman R (2008) Performance-based design: current practices and research issues. *International Journal of Architectural Computing* **6**(**1**), 2–18.

Roberts B (2009) Performative social science: a consideration of skills, purpose and context. *Historical Social Research/Historische Sozialforschung* **34**(**1**), 307–353.

Rust C, Mottram J and Till J (2007) Review of practice-led research in art, design and architecture. Arts and Humanities Research Council: Research Report.

Schultze U and Orlikowski WJ (2010) Virtual worlds: a performative perspective on globally distributed, immersive work. *Information Systems Research* **21**, 810–821.

Smith H and Dean R (2009) *Practice-Led Research, Research-Led Practice in the Creative Arts*, Edinburgh University Press, Edinburgh.

Vickers G (1965) *The Art of Judgement*, Basic Books, New York.

Vickers G (1970a) *Value Systems and Social Process*, Penguin Books, Harmondsworth.

Vickers G (1970b) *Freedom in a Rocking Boat*, Penguin Books, Harmondsworth.